

SHORT-EARED OWL (*Asio flammeus*)

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Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
15	15	7.5	5	0	0	15

Special Concern Priority

Currently considered a Bird Species of Special Concern, Priority 2 (Remsen 1978). This Priority status remains for breeding populations; wintering populations are many times greater and difficult to evaluate.

Breeding Bird Survey Statistics for California

Data inadequate for trend assessment (Sauer et al. 2000).

General Range and Abundance

This widespread owl breeds over much of northern North America; additional populations occur across Eurasia, in South America grasslands, and on many oceanic islands. Many populations are migratory; North American breeders winter south to Baja California, northern Mexico, and Florida. North American owls are attributed to the nominate subspecies *A. f. flammeus*; other named subspecies are from oceanic islands (Holt and Leasure 1993).

Seasonal Status in California

Short-eared Owls are resident in their "core" areas within California, with breeding activity stretching from March into June. More northerly populations are migratory, increasing the number of owls within California by ten-fold or more during some winters. Influxes are highly variable (and presumably tied to microtine populations elsewhere) but generally occur between late October and early March (exceptionally as early as September and as late as May; Fisler 1960, Garrett and Dunn 1981).

Historical Range and Abundance in California

Grinnell and Miller (1944) described the historical breeding range within California as "interruptedly entire length of State west of the deserts" but they considered it a breeder only "in very small numbers." Nests were known from extreme northeastern California and east of the Sierra to June and Crowley lakes, Mono County (Gaines 1992); in the Central Valley south to Merced and Fresno counties; in marshes around San Francisco Bay; and in coastal marshes in southern California at Newport Beach, Orange Co. (1928), and National City, San Diego Co. (1906; Garrett and Dunn 1981).

In contrast to the patchy and local breeders, winter visitants were "common and widely distributed." They noted these owls had once been "abundant in winter" and attributed a steep decline in the mid 20th Century to shooting by duck-hunters.

Recent Range and Abundance in California

Both the range and numbers of these nomadic owls are extremely plastic, responding primarily to the abundance of their preferred prey, especially voles (*Microtus*; see under "Ecological requirements," below). Their numbers, like those of their mammalian prey, have major upswings and serious crashes (Clark 1975). Short-eared Owls are primarily crepuscular hunters (Holt and Leasure 1993), often using the niche filled by Northern Harrier (*Circus cyaneus*) in daylight hours, but for energetic reasons they may rely more heavily on voles than does the diurnal raptor (Colvin and Spaulding 1983) and are therefore subject to greater fluctuations in numbers and range.

Core range. During draughts and other poor years for rodents, only a few resident Short-eared Owls remain in two primary "core" areas: marshes, ungrazed pastures, and wet grasslands in northeastern California and marshes in the Sacramento River delta region. Numbers vary year-to-year, and in better years the core areas expand (see below).

In Siskiyou, Modoc, and Lassen counties, Short-eared Owls are uncommon breeders at major wildlife refuges (e.g., Lower Klamath, Tule Lake, Modoc, Honey Lake, and Ash Creek) but

no reliable population estimates have been compiled (R. Ekstrom, F. Hall, T. Rickman, J. Sterling, in litt.). In good years, dozens of pairs could nest at Lower Klamath N.W.R., and up to a half-dozen pairs may nest at Modoc N.W.R. and Honey Lake W.A. (P. Bloom, pers. comm.). Spring road kills found in Surprise Valley suggest nesting efforts there also, but most (all?) of such nests are likely in Surprise and Likely valleys are lost to grazing cattle (P. Bloom, pers. comm.). In better years this "core" can expand to encompass wetlands in Fall River Valley, Shasta Co. (B. Yutzy, in litt.), Sierra Valley, Sierra Co. (*North American Bird* [NAB] files), and Table Mountain, w. Butte Co. (T. Beedy, in litt.). In most cases breeding is suspected because of summer records of owls, rather than actual nesting evidence. The core range east of the Cascade-Sierran divide can irregularly extend south to Mono Co., where they historically nested. Pairs were suspected of nesting in Bridgeport Valley in May 1984 (Gaines 1992) and along east shore of Mono Lake in June 1996 (T. Beedy, in litt.).

The other core area is the Sacramento River delta region in the southern Sacramento Valley, and especially at Grizzly Island Wildlife Area, Solono Co., where 39 nests and over 100 fledgling were documented in spring 1987 (Larsen 1987). These numbers were in apparent response to experimental upland management that resulted in major increases in microtine prey, and contrasted with the 3-6 owls found during surveys the previous two years. Management recommendations were implemented to provide habitat and prey annually, resulting in a few resident owls at Grizzly Island every since, and larger numbers some years (C. Fien, in litt.). Beyond Grizzly Island, delta breeders are possibly regular in Yolo Co., especially in the Sacramento River Bypass wetlands [S. Hampton, in litt.; also a nest record near Davis in 1976 (Remsen 1978)], and single nests are known from Cosumnes River Preserve, Sacramento Co., in the late 1990s (Jennifer Buck fide J. Trochet, in litt.) and southwest of Lincoln, Placer Co., in 1998 (J. Ranlett, B. Williams, in litt.). Pairs may also occasionally nest farther north in the Sacramento Valley in irregularly grazed wetlands west of Sutter Buttes, Sutter Co. (R. Hasey, in litt.), although none are known to breed in the waterfowl

refuges in the Sacramento Valley (B. E. Deuel, in litt.; there are a few summer records at these refuges in NAB files). There was also a nest from w. Pittsburg, Contra Costa Co., in May 1979 (NAB files), and a summer observations suggesting nesting at Byron, near the delta in Contra Costa Co., in 1980 and 2002 (S. Glover, in litt.).

Marshes around San Francisco Bay were probably once part of this core range. Breeding was known from the Palo Alto Baylands, Santa Clara Co., in 1966 and 1972 (Remsen 1978), there is a mid-summer record from the Napa Co. marshes in 1970 (NAB files), and owls nested annually on Bair I., San Mateo Co., between 1971-1973 (Gill 1977) and periodically thereafter to 1994 (NAB files; P. J. Metropulos, in litt.) but apparently not since (this locale is not often checked for owls). Non-native Red Fox predation and lowered microtine populations may account for the loss of this population over the past decade (P. J. Metropulos, in litt.).

Episodic nesting areas. In years of high microtine productivity, a cyclical phenomena apparently related to food availability and cover (Krebs 1966, Batzli and Pitelka 1971, Krebs and Myers 1974, Lambin et al. 2002), Short-eared Owls respond by producing many more young and expanding their breeding range dramatically (Lockie 1955, Holt and Leasure 1993). In California, drought-ending rains or heavy rains associated with El Nino can produce abundant herbage and cover for population explosions in voles, and episodic range expansions by Short-eared Owls. Such times may find breeding owls along the coast from northwestern California south to Monterey County, and inland through the San Joaquin Valley to the deserts of southern California.

Along the coast, following a winter with concentrations of 30 owls in ungrazed pastures with high mouse populations in winter 1989-90, at least one pair nested and was feeding young in early June 1990 in the Mad River Slough Wildlife Area of the Arcata bottoms, Humboldt Co. (Harris 1991). Summer records of courtship flights or individual birds also suggest nesting here or ungrazed sites in 1997, 1999, and 2001 (D. Fix, in litt.).

In Marin Co., three fledged young were seen at Pt. Reyes National Seashore in late June

1979, coinciding with a 1978-79 vole outbreak (Shuford 1993), and a fledged young was picked up injured in a meadow at Annadel State Park, Sonoma Co., that same spring (Burridge 1995), providing the only nesting records between the San Francisco and Humboldt bays.

In Monterey County, one or two pairs nested in the Salinas River mouth marsh in most years between 1974-1981, and breeding behavior was observed at a site on Elkhorn Slough (Roberson and Tenney 1993). These years were years of high prey densities. It is believed that the isolated population here, a site that held summer birds as early as 1959, was extirpated by non-native Red Fox (*Vulpes vulpes*) in the 1980s (Roberson 2002). Predator control programs initiated for Snowy Plover and other species have made the site tenatable again, and there have been a few winter birds most years and one summer record (1992) since then (Roberson and Tenney 1993, Roberson 2002).

Nesting Short-eared Owls in the San Joaquin Valley are also irregular and episodic, particularly after wet winters. Apparent breeders were noted patchily from Merced Co. (D. Shearwater, in litt.) south to Kern Co. in the 1970s and 1980s (e.g., ten nests found in alfalfa during summer 1983 near Wasco, Kern Co.; R. Hansen in litt.; NAB files). On the Carrizo Plain of San Luis Obispo Co., following rains in March 1991, rodent numbers rebounded and by spring 1992 nesting Short-eared Owls were encountered there (and also possibly nearby Kern Co.; S. Fitton, in litt.). A Breeding Bird Survey route through the Carrizo Plain recorded 17 and 15 birds, respectively, in 1992 and 1993, where none were found on that route in every other year between 1981-2001. There was also a remarkable extralimital breeding record for Santa Barbara I. in the n. Channel Islands in spring 1992 (Small 1994).

More recently, in Fresno County, a vole population explosion in Panoche Hills following the El Nino rains of 1998 was responsible for several broods of Short-eared Owl where none are usually found (S. Fitton, in litt.). About a dozen owls have been resident on a restoration site 3 miles from Mendota Wildlife Area since 2000, with 3 nests found in 2002, and individuals have also been seen regularly at another restoration site near Alpaugh, Tulare County (K. Kreitinger, in

litt.). The species may nest regularly in alfalfa and grain fields in the Tulare Valley (s. San Joaquin Valley; R. Hansen, in litt.).

Far to the south and inland, at Harper Dry Lake, San Bernardino Co., a recently fledged young was present in mid-June 1978, and three nests were discovered the following spring that fledged up to 12 young (Apr-May 1979 per BLM nest record cards). Ten or more nests may have been present in May 1980 when one fledgling was banded. At the time, nests were in a marsh adjacent to alfalfa fields then experiencing a population boom in rodents (P. Bloom). The documentation indicates this extralimital nesting occurred over a three-year period, not just "1980" as reported in Garrett and Dunn (1981) and other papers relying of them. Interestingly, these years (1978-1980) correspond to major microtine peaks that accommodated owl nesting as far away as Monterey, Marin, and Sonoma counties. Elsewhere in s. California, nesting was suspected in the Antelope Valley, Los Angeles Co., in spring 1992 (Garrett and Molina 1999), a year that also coincided with exceptional nesting on the Carrizo Plain (above). Except for these episodic, extralimital breeding, Short-eared Owls no longer nest in southern California, and even wintering numbers seem significantly down in recent years (G. McCaskie, C. McGaugh, L. LaPre, in litt.).

The data are too fragmentary and anecdotal to compile any reasonable population estimates of this cyclical species. Clearly, however, in poor years for microtine prey and when marsh habitat is reduced by draught, the numbers of breeding owls left in core areas are very few, and likely less than 100 pairs. Breeding Bird Survey data in areas with resident owls (e.g., Dorris, Siskiyou Co., and Honey Lake, Lassen Co., Sauer et al. 2000) routinely report only 1-4 birds/year. In wet years that bring substantial cover and that coincide with peaks of prey cycles, the nesting density may exceed 7 nests per 100 acres of appropriate habitat (Larsen 1987), and the owl population likely exceeds 1000 pairs statewide. The cycle of "boom" and "bust" makes it very difficult to quantify their true breeding status. Further, it is likely that some substantial percentage of nests are lost each breeding season to grazing or wetlands management practices (see Threats, below).

Wintering Short-eared Owls show the same wide range of variation in numbers. Christmas Bird Count data (National Audubon 2002) show that numbers reported on all California counts in the last 30 years varied five-fold (high of 152, low of 32), with highest numbers generally coincided with the best recent years for breeding (e.g., 1976-1981; 2000-2001). Christmas Count surveys do not include many of the better habitat for wintering owls, when hundreds may appear in northeastern California (NAB files) and solid numbers (e.g., 20-30/site) may occasionally appear as far south as the Kern-Pixley refuges in Kern Co. (J. Engler, J. Govan, pers. comm.) and even to inland marshes in San Bernardino Co. (e.g., up to 150 at Harper Dry Lake in 1987, Garrett and Molina 1999). In such exceptional years, it is possible that as many as 10,000 owls are present statewide. In more typical years, the true number of wintering owls is probably in the hundreds or very low thousands.

Ecological Requirements

Nesting Short-eared Owls require (a) open country that supports concentrations of microtine rodents, and (b) habitat with sufficient herbaceous cover in which to hide their ground nests from predators. Open country supporting rodents may include salt and freshwater marshes, irrigated alfalfa or grain fields, ungrazed grasslands and old pastures, and coastal or interior prairies. Marsh tules or tall grasslands with cover 30-50 cm (12-20 inches) in height can support nesting pairs. In restoration areas in the San Joaquin Valley, appropriate habitat may consist of short, weedy vegetation with native *Atriplex* or *Allenrolfia* interspersed (K. Kreitinger, in litt.). Appropriate habitat alone, though, is inadequate for nesting. Owls may not occupy even prime habitat without a sufficient microtine prey base (Holt and Leasure 1993).

Perhaps more than any other bird species on this list, Short-eared Owl has a lifestyle evolved to adapt to radical population fluctuations in its favored prey. Studies have shown that often 99% of its diet is small mammalian prey (e.g., Fisker 1960, Clark 1975). The breeding range expands and contracts, and populations levels rise and fall, with the population cycles in small rodents, and

particularly California vole (*Microtus californicus*). Like field voles in Europe and lemmings in the Arctic (e.g., Lambin et al. 2000, Krebs and Myers 1974), California vole has a 3-4 year population cycles (Krebs 1966). The voles breed throughout the year, producing 2-6 litters, but numbers peak whenever both food and cover are abundant, and most dramatically in ungrazed fields following unusually heavy rains (Krebs 1966, Batzli and Pitelka 1971). Although Short-eared Owls will resort to other prey in vole ebb years (Fisler 1960), they respond to vole peaks dramatically with more young and a much more extensive range (Lockie 1955, Clark 1975, Holt and Leasure 1993).

Threats

Historically, the primary threats to populations of Short-eared Owl were shooting, along with habitat loss and degradation (Grinnell and Miller 1944, Holt and Leasure 1993, Garrett and Molina 1999). The loss of marsh and tall grassland habitat to agriculture, urbanization, and the filling of coastal and freshwater wetlands was "certainly the main cause of decline" for this species in California in past decades (Remsen 1978).

In very recent years, however, the primary threats to the remnant existing populations in "core" regions are grazing, wetland management practices, and changing agricultural practices. Although it has been impossible to quantify, losses to grazing cattle (which destroy eggs and nests by trampling in grassland and pasture) causes significant losses each year in northeastern California (P. Bloom, R. Ekstrom, J. Sterling, in litt.). Areas that could be prime, core habitat (e.g., Surprise Valley in Modoc Co.) have few or no nesting owls because little appropriate wetland or grasslands there is left ungrazed (J. Sterling, in litt.). In areas that support episodic nesting, such as the Mad River Slough Wildlife in Humboldt Co., recent management practices that include burning cover, removing fences and posts (used by raptors), and introducing cattle grazing have excluded Short-eared Owls from most potential nesting areas (D. Fix, in litt.).

In the major Federal and State waterfowl refuges (from the Klamath Basin to Honey Lake, and in the Sacramento Valley), water management practices emphasize producing good crops of

ducks and geese to the detriment of nesting raptors. Short-eared Owls, like Northern Harriers, nest in marshes but not in water; thus they often use remaining dikes and high areas. When wetland managers flood these areas in spring (especially Apr-May), a significant number of ground-nesting raptor nests with eggs or young are lost (P. Bloom, pers. comm.). Changing agricultural practices may also seriously impact populations of Short-eared Owls. In Lassen County, for example, an invasion of non-native perennial pepper weed ("tall white top") has degraded numerous hay meadows that have been abandoned by both hay farmers and Short-eared Owls (F. Hall, in litt.). In San Bernardino Co., not only have water management practices provided less water to the marshes where owls nested in erratic but sometimes impressive numbers, but the adjacent alfalfa fields (critical for nesting success by hosting rodents) have since been converted to solar energy panels, useless to owls (P. Bloom, pers. comm.).

Shooting by duck hunters in winter, and the uneducated in summer, remains a threat to Short-eared Owls (Remsen 1978). Losses of eggs and nestlings to ground predators can be a seriously local problem, and predation pressures from non-native Red Fox likely led to the extirpation of nesting owls in the San Francisco Bay area and in coastal Monterey County (P. J. Metropolis, in litt., Roberson and Tenney 1993, Roberson 2002). Other problematic ground predators include domestic dogs, domestic cats, skunks, raccoons, and corvids, especially increasing numbers of Common Raven (*Corvus corax*) along the coast and in the deserts (Roberson 2002, Garrett and Molina 1999). Short-eared Owls are also particularly susceptible to collisions with automobiles where paved roads cross wetland or grassland habitat (Garrett and Molina 1999).

Management and Research Recommendations

Managers of Federal and State refuges and wildlife areas, and of private wildlands, need to be educated about the requirements for nesting Short-eared Owls, including the maintenance of an adequate prey base, primarily voles, for them. In essence, educate managers to consider and implement management practices that are associated with high productivity in California voles and

related microtine rodent ("manage for voles"). [Such management would also benefit other raptors than specialize in voles, including Northern Harrier and White-tailed Kite]. In particular, vole populations often increase in California grassland areas in response to the reduction or cessation of livestock grazing (Fehmi and Bartolome 2000), and thus the reduction of grazing benefits not only the owls directly (by reducing loss of eggs and nestlings) but indirectly by increasing their prey. Managers also need to be educated about the cyclical nature of this owl, and gain an understanding that there will be both "good" and "poor" years for the owls notwithstanding management practices, and thus a long-term approach to owl management is required.

In particular, managers should

- implement and monitor management practices in Federal and State refuges and wildlife areas that are conducive to both vole and Short-eared Owl productivity, including
 - leaving lush herbaceous vegetation undisturbed during the breeding season (March-June),
 - avoid cattle grazing,
 - maintain a mosaic of habitats, including, at all times, a sufficient percentage of weedy abandoned fields and wet grasslands,
 - disking fields in non-breeding seasons and planting with annuals or perennials that will result in heavy herbaceous vegetation (consider management practices at Grizzly Island Wildlife Area; see Larsen 1987),
 - avoid human disturbance within breeding areas during spring,
 - implement predator control programs where necessary, and particularly programs to eliminate non-native ground predators such as Red Fox, and
 - retain look-out posts for raptor use, including old fences and posts that emerge only a short distance above the vegetation.
- consider the effects on ground-nesting raptors, including Short-eared Owls, when implementing water management on waterfowl refuges, and particularly

- avoid flooding fields with known owl nests,
- avoid flooding wetlands to levels that cover dikes likely used by nesting raptors, and
- adopt ratios of open water to marsh and upland habitat that is sufficient to support strong predator populations (including many Short-eared Owls in cyclical highs). Owls and raptors do not utilize open water habitat; marsh, upland, and edge habitat is preferred. Implement management practices that benefit both owls and ducks; e.g., managing for owls has benefits for nesting waterfowl (see Larsen 1987, Garrett & Molina 1999).
- in managing cattle-grazed land, create and implement plans to open and close pastures to grazing in an efficient and quick method when breeding owls are found or suspected.
- in managing agricultural lands, avoid hay mowing and crop harvesting during the breeding season (particularly March-May; through June in northeastern California) in fields that have sufficient cover (1-2 feet high) to support breeding owls.
- continue field and water management practices that are beneficial to owls (and their vole prey) even in years when there are no owls. If management is stable, owls will return in the next cycle.
- protect coastal salt and interior freshwater marshes and grasslands
- educate the public about the cyclical nature of owls and their prey, and educate the value of owls in the ecosystem in an attempt to reduce shooting.
- vigorously enforce hunting requirements on refuges to reduce and eliminate non-target losses by hunting.
- consider losses to owls and other low-flying predators in planning for roads across grasslands, marshes, and agricultural land that have current or historical owl use.
- undertake surveys to establish baseline data for California population size in both (a) core areas in down cycles and (b) all areas in major boom cycles. Determine the interannual and decadal variation between these highs and lows.
- undertake research to determine the correlation between management practices and breeding

success, taking into consideration the cyclical variations of both predator and prey.

Monitoring Needs

No current monitoring efforts (e.g., Breeding Bird Survey or other surveys) are adequate to monitor annual or long-term population changes in Short-eared Owl. Surveys in both core and episodic range areas need to be implemented under standard protocols that survey at dusk, and that survey during the breeding season early (March-April) when aerial courtship flights are given (Holt and Leasure 1993). All monitoring methodologies need to consider the cyclical nature of the population and avoid drawing conclusions from short-term projects.

Acknowledgments

Steve Glover graciously provided copies of the *North American Birds* files in his custody. Larry LaPre graciously copied and forwarded Bureau of Land Management nest records cards from San Bernardino County. Ted Beedy, Pete Bloom, Bruce Deuel, Ray Ekstrom, Joe Engler, Chad Fien, Sam Fitton, David Fix, Steve Glover, Jihadda Govan, Frank Hall, Steve Hampton, Robert Hansen, Ray Hasey, Bill Keener, Robert Keiffer, Kimberly Kreitingner, Larry LaPre, Tim Manolis, Matthew Matthiessen, Guy McCaskie, Chet McGaugh, Peter J. Metropulos, John Ranlett, Paul Rauch, Tom Rickman, Debra Shearwater, David Shuford, John Sterling, John Trochet, Jerry White, Brian Williams, and Bob Yutzy all provided unpublished information about the recent status of Short-eared Owl breeding populations. Kimball Garrett and Jon Winter read an early draft of this account and helped to improve it.

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